NON-PUBLIC?: N
ACCESSION #: 9601160443
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palo Verde Unit 1 PAGE: 1 OF 7

DOCKET NUMBER: 05000528

TITLE: Reactor Trip Following the Degradation of Main Feedwater
Flow
EVENT DATE: 12/09/95 LER #: 95-014-00 REPORT DATE: 01/09/96

OTHER FACILITIES INVOLVED: Palo Verde Unit 2 DOCKET NO: 05000529

OPERATING MODE: 1 POWER LEVEL: 40

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Burton A. Grabo, Section Leader, TELEPHONE: (602) 393-6492
Nuclear Regulatory Affairs

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: EE COMPONENT: ASU MANUFACTURER: G080
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On December 9, 1995, at approximately 0320 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION), operating at approximately 40 percent power when a native desert animal (Ringtail Cat) caused a momentary phase to ground path on startup transformer NAN-X03 (non-class 1E) causing the Transformer Differential relay to trigger from a phase imbalance. This resulted in deenergization of non-class 13.8 kV buses NAN-S05, NAN-S03, and class 1E 4.16 kV bus PBA-S03 in Unit 1. Also, NAN-X03 has a second set of windings supplying Unit 2; when the transformer was isolated from the fault, this resulted in deenergizing non-class 13.8 kV buses NAN-S06 and NAN-S04, and class 1E 4.16 kV bus PBB-S04 in Unit 2. The loss of power to the class 1E 4.16 kV buses resulted in a valid ESFAS signal starting the EDGs. The loss of PBA-S03, in Unit 1, also result
d in the
loss of non-class 1E instrument power to the feedwater and steam bypass

control systems (FWCS and SBCS).

At approximately 0322 MST, a reactor trip occurred in Unit 1 when Steam Generator Number 2 (SG-2) water level reached the Reactor Protection System (RPS) trip setpoint for low SG water level following the degradation of main feedwater (FW) flow.

The root cause for the Unit 1 reactor trip was determined to be a malfunction of the FWCS' power supply, NNN-D11, transfer switch. An evaluation of the adequacy of NNN-D11 to support the FWCS and SBCS during power losses is ongoing. Any corrective actions identified will be tracked under the APS Commitment Action Tracking System.

Previous similar events were reported pursuant to 10 CFR 50.73 in LERs 529/95-005, 528/95-008, 530/94-007, 530/94-005, 530/93-001 and 529/92-001.

END OF ABSTRACT

1. REPORTING REQUIREMENT:

This LER 528/95-014 is being written to report an event that resulted in an automatic actuation of an Engineered Safety Feature (ESF) including the Reactor Protection System (RPS) as specified in 10 CFR 50.73(a)(2)(iv).

Specifically, on December 9, 1995, at approximately 0320 MST, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION), operating at approximately 40 percent power when a native desert animal (Ringtail Cat) caused a momentary phase to ground path on start-up transformer NAN-X03 (non-class 1E) causing the Transformer Differential relay to trigger from a phase imbalance, and deenergizing non-Class 13.8 kV buses (EA) NAN-S05, NAN-S03, and class 1E (EB) 4.16 kV bus PBA-S03 in Unit 1. Additionally, non-class 13.8 kV buses NAN-S06 and NAN-S04 and class 1E 4.16 kV bus PBB-S04 in Unit 2 (which are also feed from startup transformer NAN-X03) were deenergized. The loss of power to the class 1E 4.16 kV buses resulted in a valid ESFAS (JE) signal starting the Unit 1 Train A Emergency Diesel Generator (1EDG-A)(EK) and the Unit 2 EDG-B (2EDG-B). No further impacts were noted in Unit 2.

When Unit 1 PBA-S03 deenergized, the control power (NNN-D11) to the Feedwater Control System (FWCS)(JB) and Steam Bypass Control System (SBCS)(JI) was lost when the automatic bus transfer (ABT) switch did not transfer to its "Normal,, (non-class) power supply (NAN-S01). Subsequently, Main Feedwater Pump A (MFP-A)(SG) went to minimum speed, causing water levels in both steam generators (SG)(AB) to decrease. Steam Generator Number 2 (SG-2) water level reached the Reactor Protection System (RPS)(JC) trip setpoint resulting in a reactor trip at 0322 MST. Required plant equipment and safety systems responded to the event as designed. No other safety actuations occurred and none were required. The plant was stabilized in Mode 3 (HOT STANDBY) at approximately 0348 MST on December 9, 1995.

2. EVENT DESCRIPTION:

On December 9, 1995, at approximately 0320 MST, Unit 1 was in Mode 1 (POWER OPERATION) at approximately 40 percent power. Condenser hotwell (SG) leak detection activities were in progress in condenser shell C when a momentary phase to ground occurred on the Z winding of NAN-X03, phase C, causing relay 386-T1, Transfer Differential, to trigger from a phase imbalance which deenergized the non-Class 1E 13.8 kV buses NAN-S05,

NAN-S03, and the Class 1E 4.16 kV bus (PBA-S03)in Unit 1. Also, non-class 13.8 kV buses NAN-S06, NAN-S04, and class 1E 4.16 kV bus PBB-S04 in Unit 2 were deenergized.

The loss of power to the class 1E 4.16 kV buses resulted in a valid ESFAS signal starting EDG-A in Unit 1 and EDG-B in Unit 2. There were no other actions required in Unit 2, and the remainder of the event description is for Unit 1 only.

When PBA-S03 ("Emergency" power supply) was deenergized, the ABT for NNN-D11 responded to the undervoltage condition and attempted to transfer to the "Normal" power source (NHM13). (Note: NNN-D11 was lined up to the "Emergency" power supply per operations, procedures as the preferred power source.)

The ABT switch is a break-before-make switch which causes output voltage to drop for approximately 0.5 seconds on a transfer. During the event, the ABT switch attempted to transfer to the "Normal" power source; however, the "Normal" breaker did not close, leaving both supply breakers open at the same time. This resulted in the deenergization of bus NNN-D11 for approximately ninety seconds.

The deenergization of bus NNN-D11 resulted in a loss of power to the

FWCS. With the loss of power to the FWCS and its components, the economizer valves failed "as is," MFP-A went to the governor minimum speed, and the master controllers reverted to manual with no output. Non-safety related control room indications of valve positions, flows, and SG levels were lost. Annunciation of the loss of FWCS power was received. All of the above is expected on a loss of power to the FWCS. (Note: MFP-B was not in service at the time because the plant was at 40 percent power and a second MFP is not required at this power level.)

At approximately 0322 MST on December 9, 1995, the Unit 1 reactor (AC) tripped when SG-2 water level reached the RPS trip setpoint for low SG water level following the degradation of main FW flow.

With the loss of power, the SBCS went to Emergency off, all SBCVs failed closed as designed, and annunciation of loss of SBCS rack power was received. Without any automatic functions, reactor coolant system (RCS) temperature and SG pressure were controlled by a main steam safety valve (MSSV)(SB, RV) and atmospheric dump valves (ADVs)(SB) until the SBCS was

available for use. Required plant equipment and safety systems responded to the event as designed. No other safety system actuations occurred and none were required.

The Shift Supervisor diagnosed the event as an uncomplicated reactor trip. At approximately 0348 MST on December 9, 1995, the plant was stabilized in Mode 3 (HOT STANDBY).

3. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATION OF THIS EVENT:

This Unit 1 reactor trip can be classified as a Loss of Feedwater which is a moderate frequency event. Equipment and systems assumed in Safety Analysis were functional, and plant response was normal for the situation that occurred. Scenarios defined in Updated Final Safety Analysis Report (UFSAR) Chapter 15 and design assumptions of the reactor protection system are bounding for this event. Scenarios defined in UFSAR Chapter 6, concerning Loss of Coolant Accidents (LOCA), were not challenged during this transient.

The reactor coolant system (RCS)(AB) pressure peak was below 2275 pounds per square inch absolute (psia) during this event. The peak pressure criteria of 110 percent of design (2750 psia) was not challenged during this RCS pressure transient. The steam generator peak pressure was approximately 1246 psia. A main steam safety valve operated as designed to maintain SG pressure until the ADVs were used to maintain SG pressure. The ADVs were used until the SBCS became available to maintain SG pressure.

The transient did not cause any violation of the Specified Acceptable Fuel Design Limits (SAFDLs). This event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

4. CAUSE OF THE EVENT:

An incident investigation for the Unit 1 reactor trip is being performed in accordance with the APS Corrective Action Program. The cause for the Unit 1 reactor trip was that the transfer switch malfunctioned by not transferring to its "Normal" power source (SALP Cause Code B: Design). APS' design does not provide immediate uninterrupted transfer of power for the FWCS upon loss of power. The current plant configuration is in accordance with design; however, the 500 milliseconds that it takes to transfer power is not adequate to ensure that the FWCS control power is not interrupted.

No unusual characteristics of the work location (e.g., noise, heat, or poor lighting) directly contributed to this event. There were no procedural errors which contributed to this event.

If the incident investigation results differ from this determination or if information is developed which would affect the readers understanding or perception of this event, a supplement to this report will be submitted.

5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

On December 9, 1995, while Unit 1 Control Room personnel were changing the breaker configuration of NNN-D11 to the "Normal" power source, the "Normal" breaker would not close. Upon investigation, Electrical Maintenance personnel (utility, nonlicensed) determined that NNN-D11 would not transfer from "Emergency" to "Normal" and that it had not transferred during the reactor trip.

NNN-D11's transfer switch is manufactured by General Electric and the model number is CR160TC. The switch's operating voltage is 120 VAC and has a current rating of 400 amps.

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

The incident investigation of the event has not been completed to date. Any corrective actions identified will be tracked under the APS Commitment Action Tracking System.

On December 9, 1995, Electrical Maintenance performed an as-found visual inspection of the breakers and ABT for NNN-D11; no obvious problems were

noted. Upon testing, NNN-D11 would not automatically transfer to the "Normal" from the "Emergency" power supply but would consistently automatically transfer from the "Normal" to the "Emergency" power supply.

On December 10, 1995, the operating mechanism was removed from NNN-D11 and was tested in a spare breaker assembly. The alignment was satisfactory, and the operating mechanism would operate in both manual positions. The operating mechanism was being reinstalled in NNN-D11 when it was identified that the support bracket on the left side of the "Normal" source breaker had a gap of approximately one-eighth of an inch. All of the other support brackets were flush against their respective breakers. Visual inspection revealed that a micarta clipboard was used as a shim. The shim was removed, and the operating mechanism was reinstalled on the breaker assembly with satisfactory alignment. However, when tested, the operating mechanism would not close in the "Normal" position without manual assistance.

Review of the work history for NNN-D11 did not reveal the time period that the shim was installed. Electrical Maintenance personnel involved in troubleshooting NNN-D11 during the refueling outage (1R5) did not notice that a shim was installed nor did they install a shim.

On December 10, 1995, Plant Management decided to leave the work order open and to replace the supply breakers during the next refueling outage. This decision was reviewed and concurred by the Plant Review Board. This decision was based on the following two facts:

1. If power is lost while in the "Normal" position, the fast bus transfer can swap power to the motor control center that feeds NNN-D11 faster than the ABT could transfer if on the "Emergency" source. (Refer to Section 8, Additional Information)

2. If the fast bus transfer failed and total power was lost to the "Normal" power supply, the unit would trip anyway because of the loss of power to two reactor coolant pumps.

On December 9, 1995, a night order was issued to all three units detailing the power configuration for NNN-D11 and NNN-D12 in Unit 1 and a brief history and explanation for the change.

By December 21, 1995, Unit 1 Operation procedures were revised to reflect the Plant Management decision to align NNN-D11 to the "Normal" power supply. This decision was reviewed and concurred by the Plant Review Board. LER 529/95-005 identified a Unit 2 reactor trip due to low level in SG-2. The cause of the trip was that the FWCS did not consider momentary power interruptions. The evaluations of this event to improve the FWCS have not been completed to date. The corrective actions taken for LER 529/95-005 would not have prevented this event because the ABT did not automatically transfer.

If the evaluation results differ from this determination or if information is developed which would affect the readers understanding or perception of this event, a supplement to this report will be submitted.

7. PREVIOUS SIMILAR EVENTS:

Reactor trips attributed to a Feedwater Control System (FWCS) malfunction have been previously reported in LERs 528/95-008, 530/94-007, 530/94-005, 530/93-001 and 529/92-001. The corrective actions taken in these previous events would not have prevented this event from occurring.

8. ADDITIONAL INFORMATION:

Figure 1.0 provides a simplified electrical drawing of the non-Class 1E AC distribution system for Unit 1. The three startup transformers (NAN-X01, NAN-X02, and NAN-X03) connect to the switchyard through two 525 kV switchyard breakers each and feed six 13.8 kV intermediate buses (NAN-S05 and NAN-S06). These buses are arranged in three pairs, each feeding only one unit.

Each startup transformer is capable of supplying 100 percent of the startup or normally operating loads of one unit simultaneously with the ESF loads associated with two load groups of another unit. The non-Class 1E AC buses normally are supplied through the startup transformers. In the event of failure of the unit auxiliary transformer, turbine trip, or reactor trip, an automatic fast transfer of the 13.8 kV buses to the startup transformers is initiated to provide power to the auxiliary loads. During power operation, the unit auxiliary transformers (MAN-X02) supply two 13.8 kV buses (NAN-X01 and NAN-X02) which provide the majority of the power to the non-Class 1E loads.

ATTACHMENT TO 9601160443 PAGE 1 OF 2

Figure "Simplified Electrical Drawing, Unit 1, Figure 1.0" omitted.

ATTACHMENT TO 9601160443 PAGE 2 OF 2

Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 o PHOENIX, ARIZONA 85072-2034
192-00956-JML/BAG/BE
JAMES M. LEVINE January 9, 1996
VICE PRESIDENT
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528 (License No. NPF-41)
Licensee Event Report 95-014-00

Attached please find Licensee Event Report (LER) 95-014-00 prepared and submitted pursuant to 10CFR50.73. This LER reports a December 9, 1995, reactor trip on low water level in Steam Generator Number 2 and the automatic actuation of an Engineered Safety Feature, Emergency Diesel

Generator (EDG) Train A in Unit 1 and EDG Train B in Unit 2. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV.

If you have any questions, please contact Burton A. Grabo, Section Leader, Nuclear Regulatory Affairs, at (602) 393-6492.

Sincerely,

JML/BAG/BE/pv

Attachment

cc: L. J. Callan (all with attachment)
K. E. Perkins
K. E. Johnston
INPO Records Center

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